ANTERIOR GLENOHUMERAL DISLOCATIONS IN THE EMERGENCY DEPARTMENT: DO PREREDUCTION RADIOGRAPHIC FINDINGS INFLUENCE PATIENT MANAGEMENT?

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Anterior Glenohumeral Dislocations in the Emergency Department: Do Prereduction Radiographic Findings Influence Patient Management?

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ANTERIOR GLENOHUMERAL DISLOCATIONS IN THE EMERGENCY DEPARTMENT: DO PREREDUCTION RADIOGRAPHIC FINDINGS INFLUENCE PATIENT MANAGEMENT?

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Objective: To determine whether prereduction radiographs alter the emergency department(ED) management of adult patients with anterior glenohumeral dislocations.

Methods: This study was a retrospective chart review of 185 patients who presented with 227 anterior shoulder dislocations over the period April 1, 1992 to March 5, 1997. All patients were seen in the Yale-New Haven Hospital Emergency Department. Criteria for inclusion included a complete ED note, age $\geq$ 18 yrs, and a prereduction radiographic report dictated by a radiologist. Patients were grouped into two age groups for comparison of data (> 45 yrs of age and $\leq$ 45 yrs of age). Of the 227 patients with an anterior dislocation, 190 met all of the criteria.

Results: Thirty-nine percent of the prereduction radiographs had or were suspicious for defects/fractures. Twenty-one percent had a Hill-Sachs/humeral head defect, 8.9% had a Bankart/glenoid rim fracture, and 9.5% had a greater tuberosity fracture. No patient had a humeral neck or humeral shaft fracture. Despite radiographic abnormalities, every patient had closed reduction attempted in the ED except seven patients who reduced their own shoulder or had spontaneous reduction after their films. There was no evidence that emergency department management was altered in any of the 190 cases based on prereduction radiographic findings.

Conclusion: Findings on prereduction radiographs rarely alter the management of adult patients with anterior shoulder dislocations in the ED. These results provide strong evidence toward reducing the number of patients who get prereduction radiographs in the ED. This will not only reduce costs but it will reduce length of stay, allow for more immediate and easier reduction, reduce patient suffering, and reduce the amount of sedation needed. Due to the limitations of this retrospective study, a larger prospective study is warranted to validate these findings and to establish criteria that can be used to determine the need for a prereduction radiograph.

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INTRODUCTION

The shoulder is the most commonly dislocated joint in the body and patients with anterior glenohumeral joint dislocation are frequently seen in emergency departments.[1-3] It has been standard care to obtain radiographs of the shoulder before reduction of the dislocation followed by another series of radiographs after reduction.[1,4-6] Prereduction radiographs are obtained to check for associated fractures of the humerus or scapula and to check the position of the dislocation. The most commonly found bony lesions include a posterolateral defect in the humeral head (Hill-Sachs lesion) and a defect of the anteroinferior glenoid rim (Bankart lesion).[7] Adequate radiographical detection of these small osseous defects often requires special views such as the Stryker, Hermodsson, or Didiée views. [3,7-10] These views require manipulation of the shoulder for proper positioning so getting optimal prereduction radiographs is often difficult secondary to patient discomfort. In addition to prereduction radiographs, postreduction radiographs are also used to demonstrate that there is not a new fracture or a persistent dislocation. With reduced pain and more shoulder mobility, post-reduction radiographs often show abnormalities that were not detected in the original radiographs. The practice of obtaining these two series of radiographs is very time consuming and expensive and based more on tradition than on strong clinical data.

Many common practices in the emergency department are now being studied to determine the most efficient use of medical resources.[4,11] A recent study has shown that

post-reduction radiographs rarely demonstrate findings that would alter the management of the patient.[4] In that study only one out of 175 patients had findings on their postreduction films that changed their management in the ED. This study called into question the utility of routine postreduction radiographs. There have been no similar studies investigating prereduction radiographs.

Hill-Sachs and Bankart lesions are commonly found on prereduction radiographs of anterior glenohumeral dislocation.[2,7,12] These lesions are associated with a higher rate of recurrence but they do not alter the management of the patient in the emergency department.[2,7,12] There have been case reports of iatrogenic displacement of fractures in patients thought to have simple anterior shoulder dislocations who also had humeral neck fractures.[13,20] Studies among fracture clinic patients and admitted orthopedic patients report an incidence of humeral neck fractures at near 2% of anterior shoulder dislocation.[18,21] The incidence in the ED has not been determine but is likely much lower since the studies above were done on a more severely injured population. There have been about a dozen case reports of a humeral shaft fracture in association with an anterior dislocation but no reports of iatrogenic displacement.[14,25] Both of these clinically significant fractures appear to be associated with an older patient population or with significant trauma.

PURPOSE

We hypothesized that clinically significant radiographic findings are uncommon and rarely alter the management of adult patients ≤ 45 years of age being evaluated for anterior glenohumeral dislocations. In the rare instance that a radiographic finding is found that influences the acute management of a patient in this age group it would most likely be a first-time dislocation or associated with a significant trauma.

Aim of Study

- We wished to determine if radiographic findings influenced the management of adult patients being evaluated for anterior glenohumeral dislocations. Most importantly, we wanted to know whether prereduction radiographic findings changed the planned treatment in the ED. The expected outcome with an insignificant prereduction radiograph would be immediate closed reduction in the ED. With a significant prereduction radiograph, other possible outcomes would be fracture reduction followed by dislocation reduction, fluoroscopic assisted reduction, open reduction, or further radiographic study before attempted reduction.
- We also wished to collect demographic, injury, and treatment data of adult patients who presented in the emergency department with an anterior glenohumeral dislocation. This information will be useful for determining risk factors for significant prereduction radiographic findings.

METHODS

This study was a retrospective chart review of patients who presented with an anterior glenohumeral dislocation in the Yale-New Haven Hospital Emergency Department. This chart review attempted to identify all ED patients with a diagnosis of shoulder dislocation over a period from April 1, 1992 through March 5, 1997 using available ED logs and computer records. Inclusion criteria included evaluation in the ED for an unreduced anterior shoulder dislocation, ≥ 18 years of age at presentation, and a medical record with the ED note and radiograph reports(hardcopy or on a computer).

The patient list was created using the hospital's billing computer database and the daily ED logbooks. The patient list included the patient's name, sex, age, date of visit, treating doctor, and hospital record number. The computer database was searched by ICD-9 codes and by a keyword search of the diagnosis. The ICD-9 codes which were searched included 831.** (all variations of shoulder dislocation) and 718.** (pathologic dislocations and recurrent dislocations, joint not specified). The keyword search of the diagnosis included searching for the word "shoulder", "dislocation", or "dislocated". By searching the database using several possible matching methods, we hoped to reduce the possibility of missing a substantial number of records due to variability in data entry methods. Unfortunately this database is only complete for 1995 to 1997. Older records are purged from the database unless the billing for the patient visit is unresolved.

Since the computer database was incomplete, the ED logbooks were also

reviewed. The ED logbooks contain an entry for each patient seen in the emergency department. The entry includes an area to write the final diagnosis of the patient when they leave the ED. Using available ED logs, a list was created of patients that had a diagnosis of shoulder dislocation or shoulder injury. Since the logbook has limited space for a diagnosis, it may be possible that a patient with a fracture associated with a dislocation only had the fracture mentioned in the logbook. To make sure no dislocations were missed, “shoulder fracture” and “humerus fracture” were also used in creating the initial patient list from the ED logs. This was not neccesary in the computerized search since an unlimited number of ICD-9 codes can be entered for a given patient visit making it unlikely that the dislocation was not coded. ED logs were reviewed for the months of September 1993 through December 1994 except for May 1994 which could not be found.

Using the patient lists created, each chart was reviewed and information noted on a data collection form. If criteria were met then the following information, listed in Table 1, was collected.

TABLE 1. Data collected for charts that met study inclusion criteria.

Arm involved	left, right
First dislocation?	yes, no, not mentioned in PMH, unknown
Mechanism	fall (on shoulder or outstretched arm), direct blow, pull/twist, MVA(auto, motorcycle, boat, ped. vs. auto), seizure, punching, pushing, moving arm/reaching, throwing, lifting/moving objects, coughing, stretching, closing door, rolled on shoulder, unknown, other(specify)
Related activity	sports(specify), assault, sleeping/bed, unknown
Initial reduction method	scapular manipulation, Stimson's, simple traction, Kocher, traction/countertraction, Milch, Hippocratic, external rotation, self/spontaneous, internal rotation/adduction, modified Hennepin, technique not specified
Sedation used	IV/IM, general, none, unknown
Lidocaine injection?	yes, no
Prereduction films obtained?	yes, no
Prereduction series ordered	3-4 way, 2 view, acromioclavicular series, AP & Y, standard post. red. series, other(specify)
Prereduction film radiologist	First name mentioned on report.
Prereduction findings	Hill-Sachs/humeral head, Bankhart/glenoid rim, greater tuberosity fx., humeral shaft fx., humeral neck fx., other (specify)
Postreduction films obtained?	yes, no
Postreduction series ordered	3-4 way, 2 view, acromioclavicular series, AP & Y, standard post. red. series, other(specify)
Postreduction film radiologist	First name mentioned on report.
Postreduction findings	Persistent dislocation, Hill-Sachs/humeral head, Bankhart/glenoid rim, greater tuberosity fx., humeral shaft fx., humeral neck fx., other (specify)
Immobilization	sling, shoulder immobilizer, other(specify), unknown
Comments	Type of information includes results of 2nd or 3rd postreduction series, reduction complications, other reduction techniques attempted, other non-shoulder injuries, was the patient admitted, etc. . .

After data was collected, it was entered into a computer database (FoxPro®) for analysis of the results. The data collected was stratified into two groups based on age ($\leq$ 45 yrs and > 45 yrs). The incidence of prereduction radiographs that altered patient

management was calculated with 95% confidence intervals. Data was tested for statistical significance using the Chi-squared (Yates) and Fischer Exact methods where appropriate. Bonferonni correction was applied when calculating *p* values. Statistics were calculated using SISA statistical shareware.

RESULTS

Using the computer database, a list of 685 patient visits was created. Of the 685 patient visits, 187 were adult patient visits to the ED with an unreduced anterior shoulder dislocation. The other 498 included 19 patients under 18 years of age, 26 patients where the dislocation was already reduced before being evaluated, 165 acromioclavicular joint separations, 100 non ED visits, 63 other injuries, six dislocations that were not anterior, and 119 where the patient file was unavailable or the ED chart was missing.

Using the ED logbooks, a list of an additional 123 patient visits was created. Of the 123 patient visits, 40 were patient visits to the ED with an unreduced anterior shoulder dislocation. The other 83 included 47 humeral fractures with no dislocation, 27 other injuries, five acromioclavicular separations, one posterior dislocation, and three where the patient file was unavailable or the ED chart was missing.

From the total list of 808 patient visits there were 185 patients who presented to the ED with 227 unreduced anterior shoulder dislocations. Prereduction radiographs were obtained in 190 out of the 227. There was a total of 40 months where there were complete records. A "complete record" means unpurged data from the hospital's computer database or an available ED patient logbook for that month. The ED treated an

average of 5.4 unreduced anterior shoulder dislocations a month for these 40 months. Note that this average is probably an underestimation because some patient records (15%) were unavailable.

Sixty-seven percent of the patients that presented with an unreduced anterior shoulder dislocation were male. Fifty-seven percent of the dislocation occurred to the right arm. Data on handedness was not available. The average age was 36 years of age. For males the average age was 31 years of age and for females the average age was 46 years of age. Seventy-seven percent of the 227 dislocations occurred to adult patients ≤ 45 years of age. For those ≤ 45 years of age, 78% were male. For those > 45 years of age, 69% were female ($p < 0.0001$). After age 40, the ratio of female to male patients steeply rose with increasing age (Figure 1).

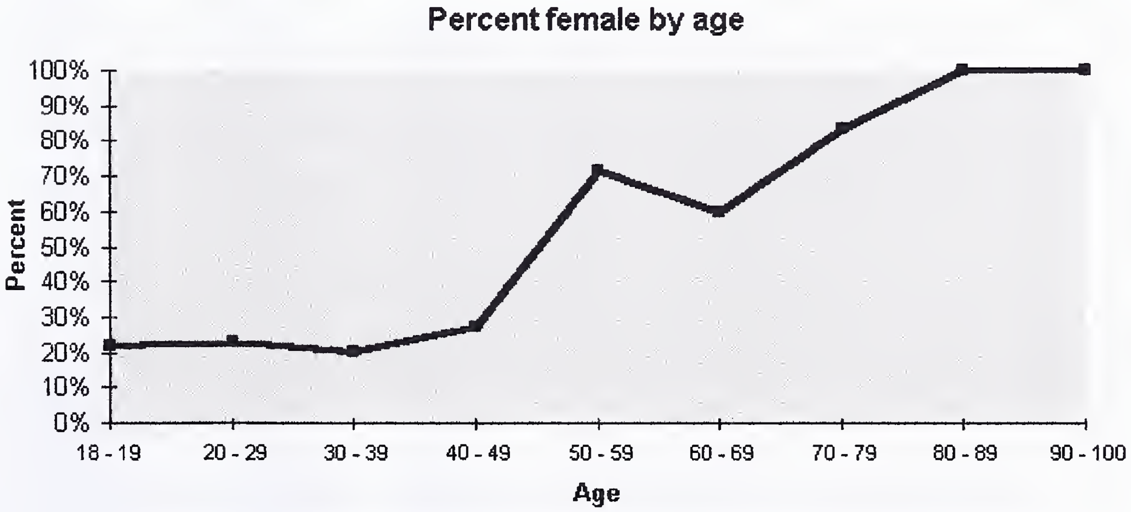

Figure 1. Percent of patients presenting with an anterior shoulder dislocation who are female by age.

About fourteen percent of the charts did not specify a mechanism for injury. Falls

[illegible]

[illegible]

Figure [illegible]

[illegible]

were the most common cause of dislocation in both age groups (38.3 %). Among those over 45 years of age, falls accounted for about 67% of the dislocations (Table 2).

TABLE 2. Mechanism of injury.

	≤ 45 yrs		*> 45 yrs*		
Mechanism	No	%	No	%	
Fall	52	29.7	35	67.3	$p < 0.0001$
Moving arm/reaching	13	7.4	3	5.8	N.S.
Direct blow	11	6.3	1	1.9	N.S.
Lifting/Moving objects	10	5.7	0	0	N.S.
Pulling	5	2.9	1	1.9	N.S.
Rolled on in bed	4	2.3	0	0	N.S.
Seizure	4	2.3	1	1.9	N.S.
Pedestrian vs. vehicle	4	2.3	1	1.9	N.S.
Other atraumatic	33	18.9	6	11.5	
Other traumatic	11	6.3	1	1.9	
Unknown	28	16.0	3	5.8	

N.S. Not significant.

Twenty-two percent of the dislocations were documented to be sports or recreation related. Of those patients where the injury was related to sports or recreation, 98% were ≤ 45 years of age. The most common sport was basketball (28%) with the next most common sport being cycling (8%). Eight percent of the dislocations were documented to be associated with a physical assault and 7% occurred while in bed or while sleeping.

Forty-eight percent of the dislocations were documented to be recurrent dislocations (Table 3). Twenty-five percent of the time, the dislocation was documented to be the first dislocation for the shoulder affected. For the other 27% of dislocations, the

chart did not document whether the dislocation was primary or recurrent. The percent of those ≤ 45 years of age documented with a recurrent dislocation was 59% while it was only 13% for those > 45 years of age ($p < 0.0001$). Of the 103 patients ≤ 45 years of age with a recurrent dislocation, 62 were documented to be atraumatic, nine were definitely traumatic, and the severity of trauma could not be determined for the other 32. Of the seven patients over 45 years of age with a recurrent dislocation, four were atraumatic and in the other three the severity of trauma could not be determined.

TABLE 3. Primary and recurrent dislocations.

	All patients		*≤ 45 yrs*		*> 45 yrs*		
	No.	**%**	**No.**	**%**	**No.**	**%**	
Primary	56	24.7	37	21.1	19	36.5	Not sig.
Recurrent	110	48.5	103	58.9	7	13.5	$p < 0.0001$
Not documented	61	26.9	35	20.0	26	50.0	$p < 0.001$

Eighty-four percent of the patients had prereduction radiographs. Of the 190 dislocations where a prereduction radiograph was obtained there were 74 (39%) radiographs that were suspicious for fractures or defects (Table 4). There were 39 humeral head or Hill-Sachs defects, 17 glenoid rim or Bankart fractures, and 18 greater tuberosity fractures. There were also five radiographs that showed bony fragments but no fracture was specified. There were no radiographs with humeral shaft or humeral neck fractures.

TABLE 4. Prereduction radiographic findings from the 190 dislocations where prereduction radiographs were obtained.

	All patients		*≤ 45 yrs*		*> 45 yrs*	
Radiographic findings	**No.**	**%**	**No.**	**%**	**No.**	**%**
Hill-Sachs/ humeral head defect	39	20.5	31	22.1	8	16.0
Bankart/ glenoid rim fx.	17	8.9	13	9.3	4	8.0
Greater tuberosity fx.	18	9.5	8	5.7	10	20.0
Bony fragments only	5	2.6	2	1.4	3	6.0
Old acromion fx.	1	0.5	0	0	1	2.0
Possible scapular fx.	1	0.5	0	0	1	2.0

There were no statistically significant differences in radiographic findings when compared by age group. All with $p > 0.05$ after Bonferonni correction.

There was no evidence that the management of any patients was influenced by the findings on the prereduction radiographs. Regardless of radiographic findings, all patients except seven had closed reduction attempted in the ED. The seven that did not have closed reduction attempted in the ED had their dislocation reduced spontaneously or were self reduced after they had their radiographs. There was a total of 140 patients ≤ 45 years of age, all with no change in management (95% CI: 0.0 - 2.6 %). There was a total of 50 patients > 45 years of age, all with no change in management (95% CI: 0.0 - 7.1 %).

For all patients that had closed reduction attempted in the ED, reduction was successful 98.2 % of the time. Four patients could not be successfully reduced in the ED after several attempts and had reduction performed with fluoroscopic assistance. Three of the four who needed fluoroscopic assisted reduction were over 70 years of age. On prereduction radiographs, one had a Hill-Sachs lesion, one had a Bankart lesion, and the other had an old acromion fracture.

There were several reduction techniques employed (Table 5). Fifty-eight percent of the time the closed reduction technique employed in the ED was not documented. Scapular manipulation and traction/countertraction were the reduction techniques most often documented. In those that did not get prereduction films, 24.3 % were reduced by scapular manipulation with eight out of nine of those patients being recurrent dislocations.

Eighty-three percent of the time the charts documented the use of IV/IM sedation, 14% of the charts were missing documentation regarding sedation, and six patients did not receive any sedation for their reduction. Of the six that did not receive sedation, four were patients that did not get prereduction radiographs. Five patients also had a lidocaine injection into the joint.

TABLE 5. Closed reduction techniques employed in the ED for all patients (N = 227), for those who had prereduction radiographs obtained (N = 190), and those who did not get prereduction radiographs (N = 37).

Reduction technique	*All patients* **No.**	**%**	*Had prereduction radiographs* **No.**	**%**	*No prereduction radiographs* **No.**	**%**
Not specified	132	58.1	114	60.0	18	48.6
Scapular manipulation	26	11.5	17	8.9	9	24.3
Traction/Countertraction	25	11.0	23	12.6	2	5.4
Simple traction	17	7.5	14	7.4	3	8.1
Stimson's (weights)	9	4.0	7	3.7	2	5.4
Self or spontaneous	8	3.5	7	3.7	1	2.7
External rotation	3	1.3	3	1.6	0	0
Other	7	3.1	5	2.6	2	5.4

There were no statistically significant differences in reduction technique for those that did not get prereduction radiographs compared to those that did get prereduction radiographs. All with $p > 0.05$ after Bonferonni correction.

Of all patients with an unreduced anterior shoulder dislocation, 94% had postreduction

radiographs. Of the 14 patients that did not get postreduction radiographs, four walked out, one had fluoroscopic reduction, one was pregnant and had no radiographs, and the reason was not documented in the other eight cases. In 181 of the 227 dislocations the patient received both prereduction radiographs and postreduction radiographs. The incidence of radiographic abnormalities was higher in the postreduction radiographs (52.1%) than in the prereduction radiographs (38.9%) (Table 6).

Of those that had both prereduction and postreduction radiographs, there were 95 with postreduction radiographic findings (Table 7). Persistent dislocations were not included since this finding cannot be compared to prereduction findings. Of the 95 abnormal postreduction films, there were 40 with findings not detected on the prereduction films. There were 32 new Hill-Sachs/humeral head defects, 10 new Bankart/glenoid rim fractures, and two new greater tuberosity fractures. Note that the findings total more than 40 because some radiographs had multiple findings. Of these 40 postreduction films, 30 were read by the same radiologist that read the prereduction film.

TABLE 6. Postreduction radiographic findings from the 213 postreduction radiographs and comparison with the incidence of prereduction radiographic findings.

Radiographic findings	*Postreduction* **No.**	*Postreduction* **%**	*Prereduction* **%**
Hill-Sachs/ humeral head defect	70	32.9	20.5
Bankart/ glenoid rim fx.	22	10.3	8.9
Greater tuberosity fx.	19	8.9	9.5
Persistent dislocation	12	5.6	NA
Bony fragments only	7	3.3	2.6
Possible acromion fx.	1	0.5	0.5
A/C separation	1	0.5	0

There were no significant differences in the incidence of specific radiographic findings when comparing prereduction and postreduction films. All with $p > 0.05$ after Bonferonni correction.

TABLE 7. The incidence of new postreduction radiographic findings not seen on the prereduction radiographs.

	When both pre and post series were done (N=181)		New findings not seen on prereduction radiographs.
Radiographic findings	**No.**	**Not on pre. film**	**%**
Hill-Sachs/ humeral head defect	59	32	54.2
Bankart/ glenoid rim fx.	18	10	55.5
Greater tuberosity fx.	19	2	10.5
Bony fragments only	6	4	66.7
Possible acromion fx.	1	0	0
A/C separation	1	1	100

DISCUSSION

Radiographs

Prereduction radiographic findings did not alter the ED management of any patient in this study.

Except for greater tuberosity fractures, the incidences of various radiographic findings were similar for both age groups. Twenty percent of those over 45 years of age had a greater tuberosity fracture on their prereduction radiograph while less than 10% of those ≤ 45 years of age had a greater tuberosity fracture. While this study did not have a size large enough to prove that this difference is statistically significant, other studies have also found a higher incidence of greater tuberosity fractures in older patients.[12,18] With a primary dislocation it is more common for the posterior joint supports to give way in those middle-aged or older.[15] This often leads to an avulsion of the greater tuberosity and explains the increased incidence of greater tuberosity fractures in the older age group.

As expected, the percentage of postreduction radiographs with positive findings exceeded that for prereduction radiographs. Of the 40 postreduction radiographs with findings not found on the prereduction radiographs, 30 were read by the same radiologist for both the pre and post reduction films. This rules out interobserver variability as the explanation. A possible explanation includes trauma to the joint during reduction but the most likely explanation is the improved quality of the postreduction films. After reduction it is much easier to manipulate the shoulder to obtain the proper views necessary to easily visualize the Hill-Sachs or Bankart lesions.[10]

Justifications for postreduction radiography include documenting adequate reduction and documenting that a new fracture was not caused by the reduction.[16,17] Justifications for prereduction radiographs include verifying that there is a dislocation and determining whether there are any significant fractures.[6,13] A significant fracture would be any fracture that would change the acute management of the patient. We found no evidence that the management of the 190 patients who had prereduction radiographs was altered in any way.

Radiographic findings have been shown to have long term prognostic value. Hill-Sachs and Bankart lesions have been associated with an increased risk of having a recurrent dislocation.[2,7,12] Greater tuberosity fractures are associated with a lower rate of recurrence.[12,16,18] Since it is more likely that the needed prognostic information will be determined on postreduction films (by our data), prereduction films are not required to determine the existence of Hill-Sachs lesions or Bankart lesions.

Age and sex

The ratio of men to women in our study was about 2:1. Simonet studied the incidence of anterior shoulder dislocations in Olmsted County, Minnesota and also found a male to female ratio of 2:1.[1] As in our study, Simonet found a much higher proportion of female to male dislocation patients in the elderly population. Rose studied the epidemiology of humeral fractures and also found an increasing incidence of proximal humeral fractures in women that sharply exceeded that of men after age 50.[19] While osteoporosis may explain the increase in proximal humeral fractures, it does not explain

the increase in shoulder dislocations. One item in common for both injuries is trauma, usually a fall. It may be that elderly women are more predisposed to falling than are elderly men. Less muscle mass may also make elderly women more predisposed to dislocation than similar aged men.

Mechanisms

The most common mechanism for dislocation was a fall in both age groups but falls were much more predominant in the older age group ($p < 0.0001$). This data, again supports the idea that older women are more predisposed to falls than are older men given the high proportion of women in the older age group. In those with recurrent dislocation, most were caused by atraumatic means such as reaching, lifting, while in bed, or doing other everyday physical activities.

Age or trauma are nearly always associated with significant bony injury in anterior shoulder dislocation.[13,14,20-23] The authors are unaware of any case reports of fractures associated with an atraumatic dislocation in a healthy young adult. It is fair to assume that patients who are healthy young adults with a dislocation associated with minimal to no trauma are at no risk for these injuries. It is very common for a healthy young adult to experience a recurrent dislocation by an atraumatic mechanism. In our study, 49% of the dislocations were recurrent with most of them being ≤ 45 years of age. At least 27% of the patients we studied were ≤ 45 years of age and experienced a recurrent dislocation documented as atraumatic. Since the degree of trauma was not documented for a large number of patients, the percentage of atraumatic recurrent dislocations in patients ≤ 45

years of age is likely higher, up to 42% of all unreduced anterior shoulder dislocations. While Hill-Sachs and Bankart lesions are more common in patients with recurrent dislocations[9], such findings do not change the acute management of the patient.

Treatment

Of all patients, there were roughly an equal number of patients reduced by scapular manipulation and traction/countertraction. These two methods accounted for nearly a quarter of the reductions, if not more, since 58.1 % of the charts did not specify a reduction technique. For those that did not get prereduction radiographs, 24.3 % were reduced by scapular manipulation, a very nontraumatic form of shoulder reduction.[24] Note that the study size was too small to show that this increased use of scapular manipulation was statistically significant. Four different attending physicians used scapular manipulation on those that did not get prereduction radiographs so a single physician's preference did not explain the increased use of scapular manipulation. All but one of the patients that did not get prereduction radiographs and had scapular manipulation were recurrent dislocations. The combination of joint laxity due to recurrent dislocations and immediate reduction probably explains the increased utilization of scapular manipulation since less force is necessary for reduction. Although there were four patients that needed fluoroscopic aided reduction, they all had initial closed reduction attempted in the ED and there was no evidence that the prereduction radiographs influenced the decision to proceed to fluoroscopic aided reduction.

Humeral neck fracture-dislocations

Although we found no patients whose management was altered, review of the literature does reveal cases where a prereduction radiograph would be critical.[13,20] The humeral neck fracture-dislocation is a very serious shoulder injury that must not be missed. This injury generally involves a fracture through the humeral neck with avulsion of the greater tuberosity, occasionally the lesser tuberosity, and sometimes displacement of the humeral head.[21] If the humeral head is not displaced at first, attempts at closed reduction can lead to significant displacement of the humeral head.[13,20] A humeral neck fracture-dislocation is very rare and usually found in the elderly population.[13,20-23] Neer looked at 1796 patients with a humeral neck fracture and/or shoulder dislocation and found 17 patients with a true anterior fraction-dislocation.[21] These 17 patients averaged 56 years of age, were often obese, and all suffered their injury from a "very hard fall." Of the 1796 patients studied, 875 had an anterior shoulder dislocation. Although the incidence of fracture-dislocation was about 2% (17/875) of dislocations, the study group consisted of patients treated by an orthopedic fracture service and probably do not reflect the typical ED anterior dislocation patient. Rowe looked at 500 patients admitted to the hospital for shoulder dislocation and found 2% were fracture-dislocations.[18] This study was of admitted patients and also does not reflect the typical ED anterior dislocation patient.

Humeral shaft fracture-dislocations

Even more rare than the neck fracture-dislocation is the humeral shaft fracture-dislocation.[14,25] These patients present as suspected humeral shaft fractures that on

radiologic exam also have a dislocation. Significant trauma usually causes this injury and it is the dislocation that is occasionally missed, not the fracture.

Limitations

This retrospective study has several limitations. It was not possible to determine whether the clinician thought the dislocation was clinically obvious prior to obtaining the radiographs. This study would also miss any patient thought to have a dislocation but on x-ray actually had a fracture only. It also is not possible to determine if the x-ray results influenced the reduction technique or the force used in reduction but there are no published criteria for choosing a technique based on a radiographic finding, so this is unlikely.

Conclusions

Studies have brought into question the tradition of obtaining routine postreduction radiographs in the ED.[4,26] This author is not aware of any other studies investigating prereduction radiographs and their effect on the management of patients with anterior shoulder dislocations.

The fact that we found no evidence that prereduction radiographs altered the acute management of any patients does not mean that we would recommend an across the board abandonment of the practice of obtaining these films. Our study group was too small to find patients with the rare fracture-dislocation. Advanced age, especially in women, and the associated weakening of bone due to osteoporosis puts an individual more at risk for

suffering a significant fracture in association with a dislocation. A severe trauma to the shoulder can also increase this risk. For those even at a slight risk for a humeral neck or shaft fracture with an anterior dislocation, albeit rare, prereduction radiographs should be obtained and reviewed before attempting reduction. For those patients not at risk for these injuries we need to seriously question the utility of prereduction radiographs.

Findings on prereduction radiographs rarely alter the management of patients with anterior shoulder dislocations in the ED. These results provide strong evidence toward reducing the number of patients who get prereduction radiographs in the ED. Fracture-dislocations have been described in the literature but they are very rare. No fracture-dislocations have been described in adult patients ≤ 45 years of age with an atraumatic recurrent dislocation. These low-risk patients represent from 27 - 42% of the patients in our study that presented with an unreduced anterior shoulder dislocation. Eliminating prereduction radiographs for these patients will not only reduce costs but it will reduce length of stay, allow for more immediate and easier reduction, reduce patient suffering, and reduce the amount of sedation needed. Due to the limitations of this retrospective study, a larger prospective study is warranted to validate these findings and to establish criteria that can be used to determine the need for a prereduction radiograph.

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